WHAT IS CLAIMED IS:

1. A machine-implemented image processing method, comprising:

computing a respective motion map for each pairing of a reference image and a respective image neighboring the reference image in a sequence of base images, each motion map comprising a set of motion vectors mapping reference image pixels to respective neighboring image pixels;

assigning respective regions of a target image to motion classes based on the computed motion maps, the target image having a target resolution level and the base images having a base resolution level equal to or lower than the target resolution level; and

computing pixel values for the target image based on corresponding pixel value contributions from the base images selected in accordance with the motion classes assigned to the target image regions.

2. The method of claim 1, wherein computing motion maps comprises generating for each image pair respective dense motion vectors describing motion at pixel locations with respective sets of parameters in a motion parameter space at sub-pixel accuracy.

3. The method of claim 1, wherein assigning regions of the target image to motion classes comprises assigning pixels of the reference image to respective motion classes and up-projecting the motion class assignments to pixels of the target image.

4. The method of claim 3, wherein assigning reference image pixels to motion classes comprises computing motion magnitude maps from each motion map, down-sampling the computed motion magnitude maps to a pyramid of motion magnitude maps at respective resolution levels lower than the base resolution level, and segmenting pixels in the pyramid of down-sampled motion magnitude maps into motion classes.

5. The method of claim 4, wherein assigning reference image pixels to motion classes further comprises iteratively segmenting pixels in the pyramid of motion magnitude maps from a coarsest resolution level up to the base resolution

level, wherein segmentation from each coarser resolution level is up-sampled to initialize the segmentation at a finer resolution level, and refined by further segmentation at the finer resolution level.

6. The method of claim 3, wherein assigning reference image pixels to motion classes comprises generating a separate motion class segmentation map for each pairing of the reference image and a respective neighboring image and merging the separate motion class segmentation maps into a unified motion class segmentation map for the reference image.

7. The method of claim 6, wherein reference image pixels are respectively assigned to a motion class selected from a motion class set including a high motion class and a low motion class, and motion vectors assigned to the high motion class have higher magnitudes than motion vectors assigned to the low motion class.

8. The method of claim 7, wherein merging the separate motion class segmentation maps comprises

assigning a given reference image pixel to the low motion class in the unified motion class segmentation map when the given pixel is assigned to the low motion class in all of the separate motion class segmentation maps, and

assigning a given reference image pixel to the high motion class in the unified motion class segmentation map when the given pixel is assigned to the high motion class in any of the separate motion class segmentation maps.

9. The method of claim 8, wherein the motion class set further includes an intermediate motion class, and motion vectors assigned to the intermediate motion class have magnitudes higher than motion vectors assigned to the low motion class and lower than motion vectors assigned to the high motion class.

10. The method of claim 9, wherein merging the separate motion class segmentation maps comprises assigning a given reference image pixel to the intermediate motion class in the unified motion class segmentation map when the given pixel is unassigned to the high motion class in any of the separate motion

class segmentation maps and is unassigned to the low motion class in all of the separate motion class segmentation maps.

11. The method of claim 1, further comprising computing an alignment accuracy map for each pairing of the reference image and a respective neighboring image based on the computed motion maps.

12. The method of claim 11, wherein computing alignment accuracy maps comprises re-mapping neighboring images to a coordinate frame of the reference image using respective motion maps, and computing correlation measures between pixels of the reference image and pixels of each of the motion-compensated neighboring images.

13. The method of claim 11, further comprising up-projecting the computed alignment accuracy maps from the base image resolution level to the target image resolution level.

14. The method of claim 13, further comprising up-projecting the motion maps from the base image resolution level to the target image resolution level, and classifying motion vectors in each up-projected motion map into valid and invalid motion vector classes based on the up-projected alignment accuracy maps.

15. The method of claim 14, wherein values of target image pixels with corresponding pixels in all neighboring images being associated with motion vectors in the invalid motion vector class are computed by interpolating up-projected pixel values of the reference image.

16. The method of claim 1, further comprising up-projecting the motion maps from the base image resolution level to the target image resolution level.

17. The method of claim 16, further comprising re-mapping the neighboring images to the reference frame of the up-projected reference image using the respective up-projected motion maps.

18. The method of claim 1, wherein regions of the target image are respectively assigned to a motion class selected from a motion class set including a high motion class and a low motion class, and motion vectors of regions assigned to the high motion class have higher magnitudes than motion vectors of regions assigned to the low motion class.

19. The method of claim 18, wherein computing target image pixel values in regions assigned to the high motion class comprises computing a pixel-wise combination of pixel value contributions from the up-projected reference image and the re-mapped neighboring images weighted based on pixel-wise measures of alignment accuracy between the reference image and the corresponding neighboring images.

20. The method of claim 19, wherein pixel value contributions from the re-mapped neighboring images are additionally weighted based on measures of temporal distance between the reference image and the corresponding neighboring images.

21. The method of claim 18, wherein computing target image pixel values in regions assigned to the low motion class comprises classifying low motion class reference image pixels and their corresponding pixels in the neighboring images based on measures of local texture richness.

22. The method of claim 21, wherein low motion class reference image pixels and their corresponding pixels in the neighboring images are quantitatively evaluated for local texture richness, and are classified into a texture class selected from the texture class set including a high texture region class and a low texture region class, and pixels assigned to the high texture region class have higher local texture measures than pixels assigned to the low texture region class.

23. The method of claim 22, wherein values of target image pixels classified into the low texture region class in the reference image and all of the respective neighboring images, are computed by interpolating up-projected pixel values of the reference image.

24. The method of claim 22, wherein a value of a given target image pixel classified into the high texture region class in the reference image or any respective neighboring images is computed based on a pixel value contribution from the up-projected reference image, and a pixel value contribution from a given re-mapped neighboring image weighted based on a measure of local texture richness computed for the given pixel, a measure of motion estimation accuracy computed for the given pixel , and a measure of temporal distance of the neighboring image from the reference image.

25. The method of claim 18, wherein values of target image pixels are computed based on pixel value contributions from a number of base images neighboring the reference image, the number of neighboring base images being different for different motion classes.

26. The method of claim 25, wherein values of target image pixels assigned to the high motion class are computed based on pixel value contributions from a fewer number of neighboring base images than the values of target image pixels assigned to the low motion class.

27. The method of claim 26, wherein the motion class set further includes an intermediate motion class, the motion vectors of regions assigned to the intermediate motion class have lower magnitudes than motion vectors of regions assigned to the high motion class and higher magnitudes than motion vectors of regions assigned to the low motion class, and values of target image pixels assigned to the intermediate motion class are computed based on pixel value contributions from a fewer number of neighboring base images than the values of target image pixels assigned to the low motion class but a higher number of neighboring base images than the values of target image pixels assigned to the high motion class.

28. An image processing machine, comprising at least one data processing module operable to:

compute a respective motion map for each pairing of a reference image and a respective image neighboring the reference image in a sequence of base images,

each motion map comprising a set of motion vectors mapping reference image pixels to respective neighboring image pixels at sub-pixel accuracy;

assign respective regions of a target image to motion classes based on the computed motion maps, the target image having a target resolution level and the base images having a base resolution level equal to or lower than the target resolution level; and

compute pixel values for the target image based on corresponding pixel value contributions from the re-mapped base images selected in accordance with the motion classes assigned to the target image regions.

29. The machine of claim 28, wherein the at least one data processing module is operable to assign regions of the target image to motion classes by assigning pixels of the reference image to respective motion classes and up-projecting the motion class assignments to pixels of the target image.

30. The machine of claim 29, wherein the at least one data processing module is operable to assign reference image pixels to motion classes by computing motion magnitude maps from each motion map, down-sampling the computed motion magnitude maps to a pyramid of motion magnitude maps at respective resolution levels lower than the base resolution level, and segmenting pixels in the pyramid of down-sampled motion magnitude maps into motion classes.

31. The machine of claim 29, wherein the at least one data processing module is operable to assign reference image pixels to motion classes by generating a separate motion class segmentation map for each pairing of the reference image and a respective neighboring image and merging the separate motion class segmentation maps into a unified motion class segmentation map for the reference image.

32. The machine of claim 28, wherein the at least one data processing module is operable to compute an alignment accuracy map for each pairing of the reference image and a respective neighboring image based on the computed motion maps.

33. The machine of claim 32, wherein the at least one data processing module is operable to compute alignment accuracy maps by re-mapped neighboring images to a coordinate frame of the reference image using respective motion maps, and computing correlation measures between pixels of the reference image and pixels of each of the motion-compensated neighboring images.

34. The machine of claim 33, wherein the at least one data processing module is operable to up-project the computed alignment accuracy maps from the base image resolution level to the target image resolution level.

35. The machine of claim 34, wherein the at least one data processing module is operable to up-project the motion maps from the base image resolution level to the target image resolution level, and classify motion vectors in each up-projected motion map into valid and invalid motion vector classes based on the respective up-projected alignment accuracy maps.

36. The machine of claim 35, wherein values of target image pixels with corresponding pixels in all neighboring images being associated with motion vectors in the invalid motion vector class are computed by interpolating up-projected pixel values of the reference image.

37. The machine of claim 28, wherein the at least one data processing module is operable to up-project the motion maps from the base image resolution level to the target image resolution level, and re-map the neighboring images to the reference frame of the up-projected reference image using the respective up-projected motion maps.

38. The machine of claim 28, wherein:

regions of the target image are respectively assigned to a motion class selected from a motion class set including a high motion class and a low motion class, and motion vectors assigned to the high motion class have higher magnitudes than motion vectors assigned to the low motion class; and

at least one data processing module is operable to compute target image pixel values in regions assigned to the high motion class by computing a pixel-

wise combination of pixel value contributions from the up-projected reference image and the respective re-mapped neighboring images weighted based on pixel-wise measures of alignment accuracy between the reference image and the corresponding neighboring images.

39. The machine of claim 38, wherein pixel value contributions from the re-mapped neighboring images are additionally weighted based on measures of temporal distance between the reference image and the corresponding neighboring images.

40. The machine of claim 38, wherein the at least one data processing module is operable to compute target image pixel values in regions assigned to the low motion class based on classification of low motion class reference image pixels and corresponding pixels in the neighboring images based on measures of local texture richness.

41. The machine of claim 28, wherein values of target image pixels are computed based on pixel value contributions from a number of re-mapped base images neighboring the reference image, the number of neighboring base images being different for different motion classes.

42. A machine-readable medium storing machine-readable instructions for causing a machine to:

compute a respective motion map for each pairing of a reference image and a respective image neighboring the reference image in a sequence of base images, each motion map comprising a set of motion vectors mapping reference image pixels to respective neighboring image pixels at sub-pixel accuracy;

assign respective regions of a target image to motion classes based on the computed motion maps, the target image having a target resolution level and the base images having a base resolution level equal to or lower than the target resolution level; and

compute pixel values for the target image based on corresponding pixel value contributions from the re-mapped base images selected in accordance with the motion classes assigned to the target image regions.

43. The machine-readable medium of claim 42, wherein the machine-readable instructions are operable to cause the machine to assign regions of the target image to motion classes by assigning pixels of the reference image to respective motion classes and up-projecting the motion class assignments to pixels of the target image.

44. The machine-readable medium of claim 43, wherein the machine-readable instructions are operable to cause the machine to assign reference image pixels to motion classes by computing motion magnitude maps from each motion map, down-sampling the computed motion magnitude maps to a pyramid of motion magnitude maps at respective resolution levels lower than the base resolution level, and segmenting pixels in the pyramid of down-sampled motion magnitude maps into motion classes.

45. The machine-readable medium of claim 43, wherein the machine-readable instructions are operable to cause the machine to assign reference image pixels to motion classes by generating a separate motion class segmentation map for each pairing of the reference image and a respective neighboring image and merging the separate motion class segmentation maps into a unified motion class segmentation map for the reference image.

46. The machine-readable medium of claim 42, wherein the machine-readable instructions are operable to cause the machine to compute an alignment accuracy map for each pairing of the reference image and a respective neighboring image based on the computed motion maps.

47. The machine-readable medium of claim 46, wherein the machine-readable instructions are operable to cause the machine to compute alignment accuracy maps by re-mapping neighboring images to a coordinate frame of the reference image using respective motion maps, and computing correlation measures between pixels of the reference image and pixels of each of the motion-compensated neighboring images.

48. The machine-readable medium of claim 47, wherein the machine-readable instructions are operable to cause the machine to up-project the

computed alignment accuracy maps from the base image resolution level to the target image resolution level.

49. The machine-readable medium of claim 48, wherein the machine-readable instructions are operable to cause the machine to up-project the motion maps from the base image resolution level to the target image resolution level, and classify motion vectors in each up-projected motion map into valid and invalid motion vector classes based on the respective up-projected alignment accuracy maps.

50. The machine-readable medium of claim 49, wherein values of target image pixels with corresponding pixels in all neighboring images being associated with motion vectors in the invalid motion vector class are computed by interpolating up-projected pixel values of the reference image.

51. The machine-readable medium of claim 42, wherein the machine-readable instructions are operable to cause the machine to up-project the motion maps from the base image resolution level to the target image resolution level, and re-map the neighboring images to the reference frame of the up-projected reference image using the respective up-projected motion maps.

52. The machine-readable medium of claim 42, wherein:

regions of the target image are respectively assigned to a motion class selected from a motion class set including a high motion class and a low motion class, and motion vectors assigned to the high motion class have higher magnitudes than motion vectors assigned to the low motion class; and

the machine-readable instructions are operable to cause the machine to compute target image pixel values in regions assigned to the high motion class by computing a pixel-wise combination of pixel value contributions from the re-mapped neighboring images weighted based on pixel-wise measures of alignment accuracy between the reference image and the corresponding neighboring images.

53. The machine-readable medium of claim 52, wherein pixel value contributions from the re-mapped neighboring images are additionally weighted

based on measures of temporal distance between the reference image and the corresponding neighboring images.

54. The machine-readable medium of claim 52, wherein the machine-readable instructions are operable to cause the machine to compute target image pixel values in regions assigned to the low motion class based on classification of low motion class reference image pixels and corresponding pixels in the neighboring images based on measures of local texture richness.

55. The machine-readable medium of claim 42, wherein values of target image pixels are computed based on pixel value contributions from a number of re-mapped base images neighboring the reference image, the number of re-mapped neighboring base images being different for different motion classes.